REMARKS

Claims 1-89 are now pending in this application.

Attached is a marked-up version of the changes being made by the current amendment.

Page 13 of the specification has been amended in conformance with 37 CFR §§ 1.84(a)(2)(iv) and 1.84(b)(2) so that reference to the color photos, necessary as the only practical medium by which to disclose the subject matter sought to be patented, has been made. Other specification amendments have been made to correct minor typographical/grammatical errors.

Applicant respectfully requests that all claims be examined. Enclosed is a $396 check for excess claim fees and a $130.00 check for the fee required under 37 C.F.R. § 1.17(h) for the Petition under 37 CFR §§ 1.84(a)(2)(iv) and 1.84(b)(2). Please apply any charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: February 20, 2002

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION

Following are the changes made to the specification. The new paragraph change (page 36, line 7) is attached hereto as a handwritten change.

Replace the paragraph beginning at page 38, line 13 with the following rewritten paragraph:

In one implementation, within the feather window, new alignment values are obtained by linearly interpolating between the different alignment values of the neighboring blocks under consideration. Another implementation uses non-linear interpolation. In either case, the interpolated alignment values then are used to obtain the new intensity value of the pixel at a particular location. In particular, the pixel at the location corresponding to the selected alignment value is used as the value for the current location. If the selected alignment value in a particular direction is not an integer, then the intensity values of the pixels that correspond to the two integer-valued displacements closest in distance to the selected displacement are appropriately weighted and combined to obtain the final new intensity value.--

Replace the paragraph beginning at page 40, line 1 with the following rewritten paragraph:

-- Another implementation adjusts for discontinuities by using warping. Although the warping process will be described hereinafter with reference to horizontal and vertical alignment values to maintain consistency with early examples, the warping process also is applicable to

other types of transformations. In one example of a warping technique, each block can be identified with a control point at its center. The horizontal and vertical alignment values that were obtained for each block can become the alignment values for the block's control point. The alignment values for the remaining pixels within the image may be obtained by interpolating between the alignment values of the nearest control points. These alignment values are then applied to the pixels within the non-reference image.

IN THE CLAIMS

Following are the changes made to the claims:

1. (Amended) A method for automatic registration of film separations, the method comprising:

accessing component images that are based on digitized film separations, wherein each of the component images includes a set of gray-level pixels;

determining automatically an alignment vector for at least a part of a selected component image from among the accessed component images; and

[correcting] reducing one or more film distortions by applying the alignment vector to the part of the selected component image.

26. (Amended) A computer program for automatic registration of film separations, the computer program residing on a computer-readable medium and comprising instructions for causing a computer to perform operations including:

accessing component images that are based on digitized film separations, wherein each of the component images includes a set of gray-level pixels;

determining automatically an alignment vector for at least a part of a selected component image from among the accessed component images; and

[correcting] reducing one or more film distortions by applying the alignment vector to the part of the selected component image.

27. (Amended) An apparatus for automatic registration of film separations, the apparatus comprising one or more processors programmed to perform at least the following operations:

accessing component images that are based on digitized film separations, wherein each of the component images includes a set of gray-level pixels,

determining automatically an alignment vector for at least a part of a selected component image from among the accessed component images, and

[correcting] reducing one or more film distortions by applying the alignment vector to the part of the selected component image.

46. (Amended) A computer program for performing registration of digitized images, the computer program residing on a computer-readable medium and comprising instructions for causing a computer to perform operations including:

selecting a first area in each of a first image and a second image;

determining which pixels in the first areas of the first and second images are feature pixels;

comparing the first areas of the first and second images by weighting (a) a comparison of feature pixels in the first area of the first image with corresponding pixels in the first area of the second image differently than (b) a comparison of non-feature pixels in the first area of the first image with corresponding pixels in the first area of the second image; and

determining a transformation for the first area of the first [separation] image based on the comparison of the first areas of the first and second images.

47. (Amended) An apparatus for performing registration of digitized images, the apparatus comprising one or more processors programmed to perform at least the following operations:

selecting a first area in each of a first image and a second image;

determining which pixels in the first areas of the first and second images are feature pixels;

comparing the first areas of the first and second images by weighting (a) a comparison of feature pixels in the first area of the first image with corresponding pixels in the first area of the second image differently than (b) a comparison of non-feature pixels in the first area of the first image with corresponding pixels in the first area of the second image; and

determining a transformation for the first area of the first [separation] image based on the comparison of the first areas of the first and second images.

54. (Amended) A method of performing registration of digitized images, the method comprising:

selecting a first image and a second image;

defining a first set of features and a second set of features;

determining a first alignment vector for a part of the first image based on the first set of features;

determining a second alignment vector for the part of the first image based on the second set of features, the determining comprising:

using the first alignment vector as an initial second alignment vector, and

choosing the second alignment vector for the second set of features from a set of candidate alignment vectors obtained by varying the initial second alignment vector;

modifying the first alignment vector, the modifying comprising:

using the second alignment vector as an initial first alignment vector, and

choosing the first alignment vector from a set of candidate alignment vectors obtained by varying the initial first alignment vector[ ]; and

repeating the determining of the second alignment vector and the modifying of the first alignment vector until a particular stopping condition is met.

59. (Amended) The method of claim 54 wherein the stopping condition is met when the first and second alignment vectors determined after a particular iteration [is] are equivalent to the first and second alignment vectors after a previous iteration.

A similar implementation that reduces the number of candidate locations searched can be performed using edge information that is captured for both vertical and horizontal directions simultaneously (for example, the edge information is based on the magnitude of the edge strength). In such a case, the distortion value computation at (deltax_selected(i-1), deltay_selected(i-1)) for iteration i need not be calculated because it already has been calculated in iteration i-1, and the single edge-map information is used instead of the horizontal and vertical edge maps discussed above. If there is not a sufficient number of useful edges in a particular direction within a block to be registered within the non-reference image or within a corresponding block in the reference image, an alternative method may be performed to select an alignment vector for this block. For example, the alignment for that direction can simply be taken to be the initial alignment for that direction. Alternatively, a larger area encompassing more blocks (or even the entire image) can be used to determine the selected alignment vector for this block. Other alternative or additional methods can also be used to select an alignment vector for this block. In one implementation, if the center portion of the image does not have enough useful edges, the alignment vector for the center is set to the selected alignment vector determined from the entire image.

Alignment Vector Application Unit

After the alignment vector determination unit 230 determines the alignment vector for each block within the color component image, the alignment vector application unit 240 aligns each block using these vectors or a modification of them. If, for example, only one block exists within the image and only one global alignment vector is computed,